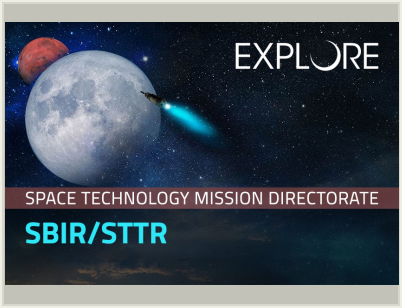
# An Optical Wake Vortex Detection System for Super-Density Airport Operation, Phase I

Completed Technology Project (2008 - 2008)

## Project Introduction

OSI proposes to develop a wake vortex detection system including a group of double-ended and single-ended optical scintillometers properly deployed in the airfield to measure ground and near ground crosswind, turbulence, and wake vortex using atmospheric turbulence-induced optical scintillations. As part of efforts, OSI also proposes to develop a single-ended optical scintillometer, together with a retro-reflector, for the measurement of near ground real-time crosswind and wake vortex. OSI will perform system analysis and design of the proposed system to detect occurrences, location, magnitude, and persistence of wake turbulence. With the simultaneous measurements of crosswind and turbulence, the sensor system is also able to forecast the arrival time of the airplane generated wake vortex drifting to a nearby runway. In the Phase I effort, OSI will determine the optimum siting criteria of deploying the double-ended and single-ended sensors on the airport. This includes combinations of parallel to runway, cross the runway, and retro-reflector on high towers installations. The goal is to form a network of sensors to cover essential areas of airport field to provide wake vortex data for the predictive modeling of wake vortex hazard. As a side benefit, the vortex detection system could measure downdraft by deploying two sets of scintillometers on both sides of the runway. The line-averaged crosswind measured by the two sets will provide real-time continuous measurements of convergence and divergence of the wind field between the two optical paths. Vertical winds, and hence the downdraft, can be derived from the measured divergence. The proposed vortex detection system will also be able to provide critical large area wind information. By incorporating this valuable information into the low-level wind shear modeling, it will greatly enhance the performance of the present airport low-level wind shear systems.

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## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Langley Research Center (LaRC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

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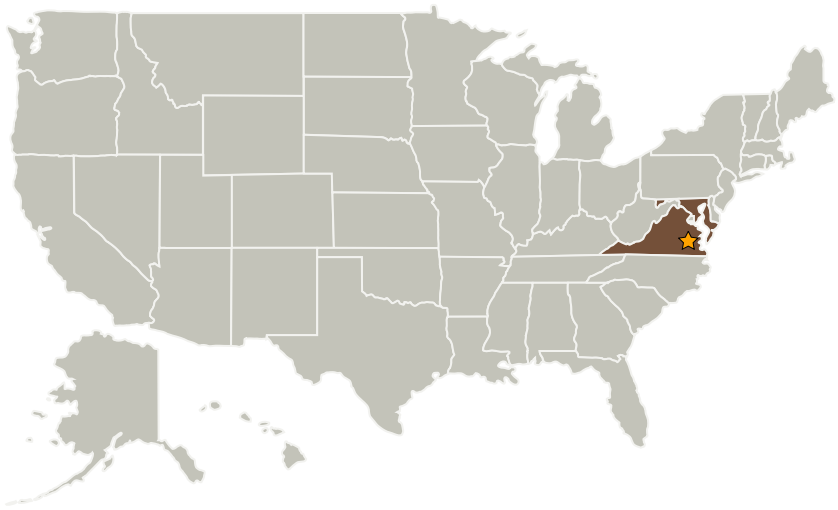
## Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Langley Research Center(LaRC) | Lead Organization | NASA Center | Hampton, Virginia |
| Optical Scientific, Inc. | Supporting Organization | Industry<br>Small Disadvantaged Business (SDB) | Gaithersburg, Maryland |

| Primary U.S. Work Locations | |
|---|---|
| Maryland | Virginia |

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Ting-i Wang

## Technology Areas

**Primary:**

- TX16 Air Traffic Management and Range Tracking Systems
  - TX16.2 Weather/Environment